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Development of a trapped-ion nuclear clock for fundamental physics research

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The nuclear transition between the nuclear ground state and the isomer of thorium-229 offers a unique opportunity for direct laser spectroscopy of the atomic nucleus. One key application is a high-accuracy nuclear clock based on the resonance frequency of this nuclear transition. Furthermore, the nuclear clock has been proposed as a highly sensitive probe for new physics, such as searching for a variation of the fine-structure constant. We are developing a trapped-ion nuclear clock utilizing triply charged thorium-229. These ions are obtained as recoil ions from the alpha-decay of uranium-233 and subsequently trapped. We will report our recent activities towards laser cooling of the trapped triply charged thorium ions.

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